



**BHAGYANAGAR GAS
LIMITED**

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

**VOLUME
II OF II**

Bid Document No.BGL/339/2016-17



Bhagyanagar Gas Ltd.

BHAGYANAGAR GAS LIMITED

(A JOINT VENTURE OF HPCL & GAIL)

BID DOCUMENT FOR

**RATE CONTRACT TENDER FOR PROCUREMENT OF
OF VARIABLE FREQUENCY DRIVES (VFD's) IN
HYDERABAD & VIJAYAWADA**

**UNDER LIMITED DOMESTIC
COMPETITIVE BIDDING**

Bid Document No.: BGL/339/2016-17

VOLUME-II of II



Bhagyanagar Gas Ltd.

**BHAGYANAGAR GAS
LIMITED**

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

**VOLUME
II OF II**

Bid Document No.BGL/339/2016-17

CONTENTS

Sl. No.	DESCRIPTION
SECTION-7	SPECIAL CONDITIONS OF CONTRACT (SCC)
SECTION-8	TECHNICAL SPECIFICATIONS
SECTION-9	SCHEDULE OF RATES/ PRICE SCHEDULE



Bhagyanagar Gas Ltd.

**BHAGYANAGAR GAS
LIMITED**

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

**VOLUME
II OF II**

Bid Document No.BGL/339/2016-17

SECTION – 7

SPECIAL CONDITIONS OF CONTRACT (SCC)



BHAGYANAGAR GAS
LIMITED

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

**VOLUME
II OF II**

Bid Document No.BGL/339/2016-17

SPECIAL CONDITIONS OF CONTRACT

GENERAL

The following article shall supplement the General conditions of Contract. Where any portion of the General Conditions of Contract and Instruction to Bidders is repugnant to or at variance with any provisions of the Special conditions of contract, then unless a different intention appears, the provision (s) of the Special Conditions of Contract shall be deemed to override the provision (s) of General Conditions of Contract to bidders, only to the extent that such repugnancies of variations in the Special Conditions of Contract as are not possible reconciled with the provisions of General Condition of Contract to Bidders. In case of an irreconcilable conflict between Indian or other applicable standards, General Conditions of Contract, Special Conditions of Contract, Specification, Drawings or Schedule of Rates, the following shall prevail to the extent of such irreconcilable conflict in order of precedence:

- i. Letter of Award/ Purchase Order
- ii. Letter of Acceptance/ FOI along with Statement of Agreed Variations.
- iii. Schedule of Rates as enclosures to Letter of Award/ Purchase Order
- iv. Special Conditions of Contract
- v. Drawings
- vi. Technical/ Material Specifications
- vii. Instruction to Bidder
- viii. General Conditions of Contract (Goods) for supply part of the contract and GCC (for procurement of works) for other than supply part of the contract.
- ix. Applicable standards as specified.
- x. Applicable standards not specified.

Scope of work:

The scope of work includes Design, Manufacture, Supply and installation of Variable Frequency AC Drives Panel (VFD Panel) for suitable Compressor Motor of 90KW load, as mentioned in SOR and as per technical Specifications of tender for Hyderabad and Vijayawada on Rate Contract basis.

Vendor to include in his quoted rates installation charges, supply of required rating & required length of power cable, Cable trays and all other required accessories for connecting with existing operational loads at locations. No extra payments shall be made except for SOR items.

LOCATION/ SITE INFORMATION:

- a) It is understood that before quoting the rates, the contractor will have complete knowledge about the work and may visit the existing installed location of VFD situated at CNG stations of BGL in Hyderabad & Vijayawada and will make him/ herself acquainted fully and understand the nature and quantum of the job to be carried out. Ignorance of this will not be considered after award of work. The contractor will be responsible to complete the entire job in all respects.



BHAGYANAGAR GAS
LIMITED

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

**VOLUME
II OF II**

Bid Document No.BGL/339/2016-17

1. The bidder must mobilize adequate manpower for this site.
2. The quantities given above against individual items/ SORs are indicative and shall not be considered to be binding. The quantities may increase or decrease at site at the time of actual execution and as per the discretion of Owner/ Engineer-in-charge. The unit rate shall be operated to work out the final payment due to Contractor.
3. BGL reserves the right to operate any SOR for the full quantities or part quantities or nil quantities as per the site conditions. In this case; BGL's decision will be final and binding.
4. **Safety rules and regulation:** Contractor shall adopt the safety rules and regulation as per the prevailing practices. The contractor shall be executing the civil & miscellaneous jobs in the running/ already operational station, the contractor has to take utmost safety in execution of the jobs. He has to appoint one dedicated supervisor for the site at CNG station at Saroornagar, and the works should be executed during day time from 09:00 AM to 06:00 PM by taking proper cold/ hot work permit systems. If the works are to be executed beyond 06:00PM, the contractor has to take prior approval from site-in-charge/ EIC & work station-in-charge. If any hot work like chipping, welding, cutting etc. have to be carried out, which can create sparks, fire etc., have to be done only in presence of BGL official by taking proper approval from site-in-charge/ EIC & work station-in-charge by deploying proper fire & safety equipments like extinguishers/ fire hydrants etc. The sites, where works will be going on; should be barricaded by putting necessary steel/ tin cover or as suitable and directed by EIC for at least 1 meter height so that these should not affect/ hamper the operation/ running of the existing equipments. All the workers shall be provided with proper safety equipments like shoes, helmets, etc. Sign boards like work under progress, danger, etc shall be displayed at the work site. Contractor shall ensure quality supervision in the working areas. No hot works are allowed in the CNG area without proper clearance from BGL.
5. **Transportation of all material:**
Shall be arranged by the contractor on his own and no separate payment shall be paid. it should be included in the offered rate.
6. **All manpower, machineries Tools and tackles:**
Equipment's, tools/tackles, machinery, labor, manpower etc for the work shall be in the scope of contractor.
7. **Validity of contract period:**
One Year (01) from the date of award of work.
8. **COMPLETION TIME:**
Design, Supply, Installation, commissioning of VFD panel at all locations shall be within 10 weeks from the date of intimation for supply through letter or e-mail by EIC.



BHAGYANAGAR GAS
LIMITED

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

**VOLUME
II OF II**

Bid Document No.BGL/339/2016-17

9. MOBILIZATION PERIOD:

NA

10. MOBILIZATION ADVANCE: Nil

11. DEFECT LIABILITY PERIOD :

One year from the date of successful completion of entire work for each location.

12. Price reduction Schedule (LD):

The price reduction schedule shall be @ 0.5% per week of delay or part thereof subject to maximum of 5% of total undelivered portion of contract value.

The said amount will be recovered from amount due to the Contractor/ Contractor's Contract Performance Security payable on demand.

The decision of the ENGINEER-IN-CHARGE in regard to applicability of Price Reduction Schedule shall be final and binding on the CONTRACTOR.

13. Contract Performance Guarantee/Security Deposit:

Bidder to provide performance Guarantee of the 8% of individual order value as per intimation from EIC plus EMD amount with in 30 days of receipt of corresponding letter of intimation from the Employer. This shall be in addition to retention of EMD at Owner's end till completion of contract period. Performance Guarantee to be submitted shall be exclusive of taxes and duties. The Performance Guarantee shall be valid for the duration of 90 days beyond the expiry of Defect Liability period.

In case of non submission of Performance Guarantee, the same amount of 8% of order value shall be retained against each RA bills/final

14. Payment Terms:

The payment shall be made progressively against supply, installation and successful commissioning of each APFC panel in the following manner.

a. 90% of supply portion value will be paid upon receipt of material (along with invoice) at site within 30days after due acceptance by EIC.

b. Balance 10% of supply portion value will be paid after successful commissioning and acceptance of EIC.

c. Installation and commissioning charges will be paid after successful commissioning and acceptance of EIC

d. Invoice in triplicate.

e. Performance Bank Gurantee(s) of 10% of contract value(If already submitted, a copy of the same)

15. SERVICE TAX:

The Quoted price/rates should be inclusive of all taxes and duties EXCEPT SERVICE TAX. It may be noted that the responsibility of payment of Service tax lies with the Service Provider only. Incase of Service tax is applicable for the



BHAGYANAGAR GAS
LIMITED

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

**VOLUME
II OF II**

Bid Document No.BGL/339/2016-17

tendered work, the contractor shall claim the service tax indicating rate of abatement/deduction allowed as per "Service Tax Act" in the 1st Invoice itself. Contractor providing taxable service shall issue an Invoice/Bill serially numbered and shall contain the following:-

- a) Name and address and Service tax Registration No of service provider
- b) Name and address of the taxable service receiver,
- c) Description, Classification and value of taxable service provided,
- d) Service tax amount

The above details are required to enable BGL to avail Cenvat credit for the service tax payment.

Payments to Service provider for claiming service tax amount will be made provided above formalities are fulfilled only. In case of any statutory variation in Service tax during the currency of the contract, the contractor shall submit a copy of Government notification to evidence the rate as applicable on the date of submission of bid and on the date of revision. Claim for payment of service tax/statutory variation in service tax, should be raised within two(2) months from the date of issue of Government Notification for payment of differential service tax, otherwise claim in respect of above shall not be entertained for payment of arrears.

16. Taxes, duties, octroi, levies etc.:

The quoted rates/prices shall be deemed to be including of all taxes including sales tax work contract tax, octroi, levies, overhead charges etc till completion of the contract and contractor shall not be eligible for any compensation on this account. Contractors are advised to quote the service tax rate, applicable at the time of submission of offer, clearly in their commercial bid/s. While arriving the lowest bidder (among the bidders who have quoted for the work), L1, service tax shall be taken in to account while calculating the bid value.

17. The Engineer In charge shall have the power to :

- A) issue the further necessary instruction to the contractor from time to time during the progress of the work for the purpose proper and adequate execution of it and the contractor shall carry out and be bounded by the same
- B) Order the contractor to remove or replace any workmen whom the company considers incompetent or unsuitable on the opinion of the company's representative as to the competence of any workman engaged by the contractor. The decision of EIC shall be final and binding on the contractor.

18. PHOTOGRAPHS/LABOUR PERMISSION/VEHICLE PERMISSION:



BHAGYANAGAR GAS
LIMITED

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

**VOLUME
II OF II**

Bid Document No.BGL/339/2016-17

The contractor shall arrange to make photo gate passes/labour permissions/vehicle passes etc. for his persons/labours/vehicles for working in site plant premises at his own cost as rules of the company.

**19.RESPONSIBILITIES OF THE CONTRACTOR AND COMPLIANCE WITH
LABOUR/INDUSTRIAL LAWS:**

- A) The contractor shall discharge obligation as provided under various applicable statutory enactments including the Employees Provident Fund and miscellaneous Provisions Act 1952, the employees state insurance (ESI) act 1948, the contract labour (regulation and abolition)act 1970, the inter state Migrant workmen (regulation of employment and conditions of service)act 1979,the minimum Wages Act, 1948 the payment of wages act 1936 ,Workman Compensation Act 1923, payment of bonus act, and various other labor legislations as in existence (at present in India) and as amended from time to time
- B) The contractor shall be responsible for required contributions towards PF . ESI, Pension or any other statutory payments to be made in respect of the contract and the personnel employed for rendering the services to BGL and shall deposit these amounts on or before the prescribed dates. Every contractor shall submit the proof of depositing the employee's and employers contributions. The contractor shall be responsible to pay any administrative /inspection charges thereof, where applicable ,in respect of the personnel employed by him for the work of BGL
- C) The contractor shall regularly submit all relevant records/documents to BGL representative for verification.
- D) The contractor shall be solely responsible for the payment of wages and other dues to the personnel, if any, deployed by him latest by 7th day of the subsequent month.
- E) The contractor shall indemnify BGL against all claims, demands, actions, cost and charges etc brought by any court, Competent Authority / Statutory Authorities against any act or acts of the contractor or his worker.
- F) The contractor shall ensure regular and effective supervision and control of the personnel, if any, deployed by him and gives suitable direction for undertaking the contractual obligations.
- G) The contractor shall not employ or permit to be employed any person suffering from any contagious, loathsome or infectious disease. The contractor shall deploy the workers after verification of their character and antecedents. In case any worker is found having criminal record, he shall have to be



BHAGYANAGAR GAS
LIMITED

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

**VOLUME
II OF II**

Bid Document No.BGL/339/2016-17

immediately replaced without assigning any reason under intimation to Engineer-In Charge.

- H) The personal to be deployed to carry –out the job should be on rolls of the Contractor/contracting firm.

20. GUARANTEE/WARRANTY

In partial modification to GCC-Goods clause no. 20, Guarantee/Warranty shall be Twelve months from the date of commissioning of each VFD at particular location or 24 months from last date of shipment.

- 21.** All the tender papers must be stamped and signed



Bhagyanagar Gas Ltd.

**BHAGYANAGAR GAS
LIMITED**

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

**VOLUME
II OF II**

Bid Document No.BGL/339/2016-17

SECTION – 8

TECHNICAL SPECIFICATIONS



BHAGYANAGAR GAS
LIMITED

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

**VOLUME
II OF II**

Bid Document No.BGL/339/2016-17

General Specification for Variable Speed Drive

This specification defines:

- Requirements for the Manufacturer/ Company Authorised System Integrators
- General requirements for the Drives User Interface
- Minimum software features required documentation
- Environmental requirements
- Harmonic limits
- Electro-Magnetic Compatibility



**BHAGYANAGAR GAS
LIMITED**

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

**VOLUME
II OF II**

Bid Document No.BGL/339/2016-17

Table of contents:

1. General
2. Requirements for the Manufacturer/ Company Authorised SI
 - 2.1 Certifications
 - 2.2 Experience
 - 2.3 Local support
3. Basic requirements for the AC Drives
 - 3.1 General requirements
 - 3.2 AC Drive performance
 - 3.3 Quality assurance and warranty
 - 3.4 Protections
 - 3.5 Safety
4. Enclosure and mounting
 - 4.1 Open style
 - 4.2 Packaged style
5. User interface
 - 5.1 General
 - 5.2 Inputs and outputs
 - 5.3 Communications
 - 5.4 Programming terminal
 - 5.5 Application programming
 - 5.6 PC Tools
6. Software features
7. Environmental effects
 - 7.1 Harmonic Distortion
 - 7.2 EMC Regulations and Compatibility / UL/CSA / C-Tick / Gost
8. Documents
 - 8.1 Documents to be delivered with the quotation
 - 8.2 Documents to be delivered with the delivery



1. General

This part of the specification describes the general requirements for the Variable Speed Drives, herein referred to as AC Drives, for use with standard IEC or [NEMA A] [NEMA B] [NEMA D] [NEMA E], [Wound Rotor] design AC motors and synchronous motors with permanent magnets. The nominal values, the standard documents and the drive's minimum performance are defined in this part. The AC Drive does not include motor in this specification.

To avoid any mismatch between the motor and its control equipment, the AC Drive shall be capable of auto adjustment by automatic measurement of the motor parameters without motor rotation.

1. Requirements for the Manufacturer/ Company Authorised SI

2.1 Certifications

The Frequency Converter Manufacturer/ Company Authorised SI shall have a valid ISO 9001 (2000 version) certification and an applicable quality assurance system.

The Frequency Converter Manufacturer/ Company Authorised SI shall have the Environment Certification ISO 14001.

The Frequency Converter Manufacturer/ Company Authorised SI shall furnish the Product Environmental Profile (P.E.P.) on the engineer's request.

2.2 Experience

The Frequency Converter Manufacturer/ Company Authorised SI should have adequate experience in frequency converter manufacturing and have adequate business volume in order to provide credibility in his commitments and a capability of long term support. The bidder should have executed similar type of jobs/projects.

2.3 Local support

The Manufacturer/ Company Authorised SI shall be able to offer commissioning of the drive.

The most common spare parts like fuses, IGBTs as well as main control- and I/O-boards shall be available in 72 hours. The more rarely used spare parts should be available in maximum 7 working days on site.

3. Basic requirements for the AC Drives

3.1 General requirements

The AC Drive shall comply with National and International standards and the recommendations for electrical industrial control devices (IEC, EN, UL, NFC, VDE).

3.1.1 ANSI/NFPA 70 : National Electrical Code



Bid Document No.BGL/339/2016-17

- 3.1.2 EN50178 : Electronic equipment for use in power installation
- 3.1.3 CSA C22.2 No. 14-M91 : Industrial Control Equipment
- 3.1.4 IEC 68 Part 2-3 : Basis Environmental Testing Procedures Part 2: Tests - Test Ca:
Damp Heat
- 3.1.5 IEC 146.1 : Semiconductor Converters - General Requirements and Line
Commutated Converters Part 1-1: Specifications of Basic Requirements
- 3.1.6 IEC 664 : Insulation Co-ordination for Equipment Within Low-Voltage Systems
- 3.1.7 IEC 447 : Man-Machine Interface Actuating Principles
- 3.1.8 IEC 439 Part 1 :Low Voltage Switch gear and Control gear Components
- 3.1.9 IEC 364 : Electrical Installation of Buildings
- 3.1.10 IEC 204/NFPA 79 : Electrical Equipment of Industrial Machines/Industrial
Machinery
- 3.1.11 IEC 106 : Guide for Specifying Environmental Conditions for Equipment
Performance Rating
- 3.1.12 IEC 529 : Degrees of protection Provided by Enclosure
- 3.1.13 IEC 1000 : Electromagnetic Compatibility
- 3.1.14 IEC 1800 : Adjustable speed Electrical power drive systems
- 3.1.15 IEC 721 : Classification of Environmental Conditions
- 3.1.16 IEC 255-8 : Overload Relays
- 3.1.17 IEC 801-2,-3,-4,-5 : Immunity Tests
- 3.1.18 NEMA ICS Part 4 : Overload Relays
- 3.1.19 NEMA ICS7 : Industrial Control and Systems Variable Speed Drives
- 3.1.20 UL 508C : UL Standard for Safety Power Conversion Equipment

The AC Drive shall be of the most modern design, yet user friendly and be simple to install, commission and maintain. The AC Drive shall be able to start and control the speed of a standard squirrel cage induction AC motor. The AC Drives shall be:

CE marked, conforming to European Low Voltage (73/23/CEE and 93/68/CEE) and EMC (89/336/CEE) Directives, UL/CSA marked according to UL 508C.

The AC Drives have to be built to comply with the IEC standards. For the Australian market the AC Drive shall have a C-tick marking, for the Russian market or Eastern Europe market the AC Drive shall have a GOST marking.

The materials used in the AC Drive shall be recyclable, non-toxic and flame retardant. The AC Drive shall comply with the European directive RoHS (Restriction Of Hazardous Substances) that prohibits the use of materials such as lead, chromium 6...

The AC Drive shall be a digitally controlled drive, using, at least, the Pulse Width Modulation (PWM) with flux vector control open loop and closed loop, with both speed and torque control modes, an algorithm to control unbalanced loads (ENA system), and a safety function (see chapter safety).It shall have IGBT's in the inverter section of the throughout the power range, and it shall have the following minimum specifications.



**BHAGYANAGAR GAS
LIMITED**

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

**VOLUME
II OF II**

Bid Document No.BGL/339/2016-17

Operating conditions:	
Rated Input Voltage :	380V -15% 480V +10%, three-phase, or
Rated Input Frequency :	50Hz -5% to 60Hz +5%
Fundamental Power Factor :	0.97 or better at nominal load
Efficiency :	<input type="checkbox"/> 98 % at nominal load
Output Voltage :	0 - U _N , three-phase
Output Frequency Range :	0 to 1000 Hz up to 37kW,(50HP), adjustable 0 to 500 Hz above 37kW, (50HP), adjustable
Accel/Decel Time :	0.01 - 6000 s, adjustable, linear, with S, with U or customized shapes
Overload capability (Constant Torque) :	150% of nominal AC drive current for, and 165% of nominal AC Drive current for 2sec
Operating ambient Temperature:	-10°C up to 50 °C, for higher temperatures see below
Storage ambient Temperature:	-25°C up to 70 °C
Maximum operating altitude:	1000 m without derating
	1000...3000 derating the current by 1% per additional 100 m.
	Limited to 2000 m for the "Corner Grounded" distribution network

Max. Relative Humidity (IEC 60068-2-3) :	95 %, without condensation and dripping water.
Max. Corrosion Level of the Cooling Air :	IEC 721-3-3, class 3C1. In option, conformal
Chemical Gases :	coating shall be requested to comply with IEC 721-3-3 Class 3C2.
Solid Particles:	IEC 721-3-3, class 3S2
Max. Vibration Level (IEC 60068-2-6)	
2 to 13 Hz	1.5 mm, peak to peak
13 to 200 Hz	1 m/s ²
Shock Level	according to IEC/EN 60068-2-27



BHAGYANAGAR GAS
LIMITED

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

**VOLUME
II OF II**

Bid Document No.BGL/339/2016-17

Max. Ambient Pollution degree	
according to EN 50178 :	Degree 2, up to 15 kW (20 HP)
according to UL 508C :	Degree 3, above 15 kW (20HP)
Main Protections:	Overcurrent, short circuit between phase, short circuit between phase and ground, impedant short circuit, input phase loss, output phase loss, motor overload, overvoltage, under voltage, over speed, IGBT over temperature, heat sink over temperature, other internal faults.
Control supply:	could be internal so provided by the AC Drive itself, or provided by an external 24V dc supply

Bid Document No.BGL/339/2016-17

The AC Drive shall be able to give a 100 % output current continuously in the above specified conditions. In order to ensure that the drive can provide the required output current in the specified ambient conditions, the Manufacturer/ Company Authorised SI shall inform the required derating, if the ambient temperature given in the project-specific specification is higher than 50 °C or if the installation altitude is more than 1000 m above the sea level. The derating factor shall be specified so that neither the lifetime of the AC Drive nor the unit's performance, overload capability included, nor the reliability of the AC Drive shall suffer.

3.2 AC Drive performance

3.2.1 Motor control type

- Sensoreless (SVC) voltage vector control for AC motors for multiple motors supply
- Sensoreless (SVC) current vector control for AC motors for a single motor supply
- Closed loop current vector control for AC motors for a single motor supply
- Volt per hertz 2 or 5 points for AC motors
- Sensoreless vector control for synchronous motors
- Energy Adaptation system (ENA) for unbalanced load

3.2.2 Speed range in the motor quadrant

- 1:100 in sensoreless vector control
- 1:1000 in closed loop vector control
- 1:50 in Sensoreless vector control for synchronous motors

3.2.3 Speed range in the generator quadrant

- 1:50 in sensoreless vector control
- 1:1000 in closed loop vector control
- 1:50 in Sensoreless vector control for synchronous motors

3.2.4 Overtorque capability

- at least 170% of the rated motor torque during 60s
- at least 200% of the rated motor torque during 2s

3.2.5 Speed accuracy

- 10% of the nominal slip of the motor in sensoreless vector control
- 0.01% of the nominal speed of the motor in closed loop vector control

3.2.6 Torque control accuracy

- 15% in sensoreless vector control for AC motors
- 5% in closed loop vector control for AC motors

3.2.7 Current at standstill

- 100% of the nominal peak current up to 75kW
- 80% of the nominal peak current above to 75kW

3.2.8 Braking capabilities

- Up to 160kW, the drive shall integrate a braking IGBT
- 100% of the rated torque continuously
- 170% of the of the rated motor torque during 60s
- From 200 kW up to 500kW, the braking IGBT could be external

3.3 Quality assurance and warranty

Every AC Drive has to be tested functionally. The inverter part of the AC Drive or each



Bid Document No.BGL/339/2016-17

inverter module at least has to be tested by running it with a motor at full nominal load. A test report of the tests made shall be delivered by the Frequency Converter Manufacturer/ Company Authorised SI on engineer's request.

An 12-month parts warranty shall be provided on materials and workmanship from the date of purchase.

3.4 Protections

3.4.1 Circuit breaker coordination and short circuit protection shall eliminate the need for current-limiting and semiconductor fuses. Tables for Type 1 and Type 2 coordination, combining circuit breaker, contactor and AC Drive shall be provided and certified.

3.4.2 The AC Drive shall be UL 508C listed for use on distribution systems. The AC Drive shall have a coordinated short circuit rating designed to UL 508C and NEMA ICS 7.1 and listed on the nameplate. The AC Drive shall not create a hazard in the event of a short circuit at any point within the AC Drive when it is connected to a power source as specified on the nameplate and protected as specified.

3.4.3 Upon power-up the AC Drive shall automatically test for valid operation of memory, option module, loss of analog reference input, loss of communication, dynamic brake failure, DC to DC power supply, control power and the pre-charge circuit.

3.4.4 The Power Converter shall be protected against short circuits, between output phases and ground; supplies provided by the AC Drive shall be protected against short circuits and overloads

3.4.5 The AC drive shall have a minimum AC under voltage power loss ride-through of 200 msec. The AC Drive shall have the user-defined option of frequency fold-back to allow motor torque production to continue to increase the duration of the power loss ride-through.

3.4.6 The AC drive shall have a selectable ride through function that will allow the logic to maintain control for a minimum of one second without faulting.

3.4.7 The deceleration mode of the AC drive shall be programmable for normal and fault conditions. The stop modes shall include freewheel stop, fast stop, DC injection braking and as fast as possible.

3.4.8 Upon loss of the analog process follower reference signal, the AC Drive shall fault and/or operate at a user-defined speed set by a software programmed speed settings or last speed.

3.4.9 The AC Drive shall integrate a protection against IGBT chips over temperature that is different from the heatsink overheat.

3.4.10 The AC drive shall have solid state thermal protection that is UL Listed and meets UL 508C as a Class 20 overload protection and meets IEC 947. The minimum adjustment range shall be from .25 to 1.36% of the current output of the AC Drive. The motor thermal state shall be memorized and shall decrease following the motor rating even when the power is OFF.

3.4.11 The AC Drive should be able to protect the motor when PTC probes are connected.

3.4.12 The AC drive should be able to limit the motor terminal voltage to twice the DC bus voltage

3.4.13 The AC drive shall display all faults in plain text and help screens shall be available to



guide the user in the troubleshooting. Codes are not acceptable.

3.5 Safety

- 3.5.1 The AC drive shall be integrated directly in the safety chain complying with EN 954-1 category 3, and with IEC/EN 61508-1 SIL2.
- 3.5.2 The AC drive shall integrate the "Power Removal" safety function which prohibits unintended equipment operation. The motor no longer produces torque.
- 3.5.3 This safety function shall comply with standard for safety of machinery EN 954-1, category 3 ; standard for functional safety IEC/EN 61508, SIL2 capability (safety control-signaling applied to processes and systems)
- 3.5.4 The "Power Removal" safety function shall have a redundant electronic architecture that shall be monitored continuously by a diagnostics function.
- 3.5.5 This SIL2 and category 3 level of safety function shall be certified as conforming to these standards by a certification body under a program of voluntary certification.
- 3.5.6 The Power removal function shall comply with the definition of the draft product standard IEC/EN 61800-5-2 for both stop functions, Safe Torque Off ("STO") and Safe Stop 1 ("SS1")
- 3.5.8 The AC drive Manufacturer/ Company Authorised SI shall provide the certified schematics and the list of devices in order to comply with IEC/EN 60204-1 stopping category 0 and 1.
- 3.5.9 The relay contacts shall comply with EN-81 13.2.2.3

4. Enclosure and mounting

4.1 Open style

4.1.1 Mounting type

- side by side
- vertical position +/- 10°
- When mounted in an enclosure, the AC Drive shall have an IP54 / NEMA 12 power section in order to evacuate the heat outside the enclosure

4.1.2 protection degree : IP20, or IP21, or IP54 (available during first quarter 2006)

4.2 Packaged style

4.2.1 Power range: from 90kW to 500kW 380/480V

4.2.2 Protection degree: IP23 or IP54

4.2.3 Panel design specs:

- Standards: IEC 439-1, EN 60439 & VDE660 Part 500.
- Cabinet access: From front
- Cable entry and exit: Bottom entry
- Color, front: RAL 7032

4.2.4 Standard equipment of the enclosure

- Protection by Switch and Super Fast Fuses
- The Programming terminal of the AC Drive shall be accessible for programming and controls with the main door closed.
- The whole assembly shall be implemented with a strict consideration of the EMC Compatibility and Regulations as described further in this specification.
- Total harmonics distortion shall comply with IEC 61800-3-12. Harmonic reduction



Bid Document No.BGL/339/2016-17

shall be carried out with a 3% inductance or equivalent

- Cables shall be handled by mechanical fixation
- Air output shall not be located in on the front of the enclosure 4.2.5 Other equipments could be integrated depending on the request.

5. User interface

5.1 General

The user interface shall be identical throughout the power range to avoid confusion amongst the users and need for training in several different units.

5.2 Inputs and outputs

5.2.1 At least, the following standard Inputs and Outputs shall be provided, to be used in interface with the control system:

Analogue Inputs:	1 x Programmable differential voltage input + 10V 1 x Programmable current input 0(4) - 20mA 1 x Programmable voltage input 0 - 10V
Analogue Output:	1 x Programmable differential voltage input + 10V 1 x Programmable current input 0(4) - 20mA 1 x Programmable voltage input 0 - 10V
Logic inputs:	6 x Programmable logic Inputs isolated from the mains (One of these inputs could be used for PTC probe) All logic inputs may be used either in sink or source
Safety input:	One input dedicated to the Power removal safety function In option, digital inputs may be used with 115V control supply
Relay Outputs:	2 x Programmable Digital outputs with a changeover dry contact
Reaction time:	2ms +/- 0.5ms (except for the relays)

All the control terminals shall be clearly marked.

5.2.2 It shall be possible to extend the number of inputs / outputs of the AC Drive upto :

- 14 logic inputs
- 4 analogue inputs
- 3 analogue outputs
- 2 logic outputs (open collector)
- 4 relays

5.2.3 At least, it shall be possible to assigned the following functions to the I/Os:

Analouge Input	Analogue Outputs
Speed reference	Motor current
Summing reference	Motor frequency
Subtracting. Reference unsigned)	Motor torque ((signed or



Bid Document No.BGL/339/2016-17

Multiplying reference	Motor power
Torque reference	Motor voltage
Torque limitation	Output frequency (signed or unsigned)
PID feedback	PID error
Manual PID reference	PID feedback
PID speed reference	PID output
Forced local	PID reference
Weight measurement	Ramp output
	signed ramp
	Torque reference (signed or unsigned)
	Drive thermal state
	Motor thermal state
	Torque limitation
Logic input	Relay or logic outputs (open collector)
Run	Ready
Forward	Drive running
Reverse	Frequency reference attained
Jog	Current attained
Preset speeds	High speed attained
Reference switching	Drive fault
Ramp switching	Frequency threshold attained
Fault reset	Torque sign
Fault inhibition	Motor thermal state attained
Auto / manual	Drive thermal state attained
PID integral reset attained	Torque or current limitation
preset PID reference	Brake control
Torque limitation activation	Output contactor command
Analog torque limitation activation	Input contactor command
Torque reference sign	Limit switch attained
Torque /speed control switching	Current present
Brake contact feedback	Power removed
Command switching	Sync wobble
Parameter sets selection	Alarm Groups
Disable limit switch	Alarm (load slipping, 4 – 20mA
	Loss,brake Control,external fault, PTC,
	PID error,PID feedback,IGBT temperature
	Undervoltage , Torque Control,drive
	Temperature , braking resistor)
DC injection	Active configuration
Freewheel stop	Active parameter set
+ speed	Active channel



Bid Document No.BGL/339/2016-17

- speed	In braking
External fault	DC bus charged
Pre Fluxing	DC bus charging
Forced local	Spool end
Current Limitation Activation	
Traverse Control	
Int. Traverse Control	
Counter Wobble	
Output Contactor	
Evacuation	
Reference memorisation	
Auto- tuning	

5.3 Communications

5.3.1 The AC drive shall integrate as standard 2 Modbus ports and 1 Can Open port.

5.3.2 The AC drive shall have the capability for internal mounted communication card. The following protocols shall be the minimum available :

- Ethernet TCP/IP
- Modbus Plus
- FIPIO
- Profibus DP
- DeviceNet
- InterBus-S

5.3.3 The AC drive shall be piloted following :

- Drivecom profile (CANopen CiA DSP 402)
- I/O profile where the command is as simple as the wired logic
- ODVA profile for DeviceNet network only

5.3.4 The speed or torque command and reference may come from different control sources - I/O terminals

- Communication network
- programmable card
- Remote graphic display terminal

The AC Drive shall be able the switching of these control sources according to the application requirements.

5.3.5 The AC drive shall integrate its own programmable communication scanner to always provide periodic variable exchange.

5.3.6 The control section of AC drive shall be supplied separately if necessary with 24V DC, to keep the network communication always available even if the power supply is OFF.

5.3.7 The AC drive behavior shall be programmable on communication fault

5.3.8 Advanced monitoring and diagnostic functions shall be available through the



Bid Document No.BGL/339/2016-17

programming terminal : Monitoring of :

- The communication scanner
- Command words sent by the different sources
- Command words taken by the AC drive
- 4 words which addresses are selectable

5.4 Programming terminal

5.4.1 The AC drive shall have a detachable keypad with a back lit 8-line, with a minimum of 23-character alphanumeric operating display for programming and controlling purposes. An IP54 or IP65 remote mounting shall be possible at a distance of 10m. The programming shall be able to operate in a multi-point connection. The displayed messages shall be in user friendly, descriptive text in multiple languages, including English, German, French, Italian, Spanish and Chinese. It shall be possible to change to replace 5 languages by other ones by a simple download. Coded messages are not acceptable.

5.4.2 Using a shuttle button shall carry out the navigation in the menu and the parameter setting.

5.4.3 Parameter setting shall be easily accessible and user friendly with actual text messages and actual setting range.

5.4.4 Visibility and protection shall be selected for each parameter. Password protection shall be provided to avoid unauthorized tampering with the set parameters.

5.4.5 The programming terminal shall offer the possibility of memorizing and downloading 4 configurations of the AC drives to save time during the commissioning and to avoid mistakes.

5.4.6 Direct access to the 10 last modifications shall be provided.

5.4.7 4 programmable function keys shall be available for short cuts, application functions

5.4.8 3 Monitoring shall be possible up a distance of 5 meters. By using digital values and/or bar graph. Dedicated functions shall be provided such as I/O map, Communication map.

5.4.9 The programming terminal shall be able to display the commercial reference of the AC drive and of the options, the software version, the serial number

5.4.10 The user shall be able to customize the interface :

- Creation of a user menu
- Customization of 15 parameters : name, scaling, unit
- Integration of bitmaps

5.4.11 The programming terminal shall integrate a Simply Start menu for fast and easy commissioning.

5.4.12 Direct keypad entry shall be provided to observe the following actual parameters. Any two of the following parameters or actual values shall be selected to always be displayed whatever the operation carried out with the programming terminal.

- Signed Frequency reference
- Input Frequency
- Output Voltage
- Output Frequency
- Mains Voltage
- Output Power



Bid Document No.BGL/339/2016-17

- Motor Torque
- Motor Speed
- Motor voltage
- Motor current
- Motor power
- Motor Thermal state
- Drive Thermal state
- PID actual values

The following parameters shall always be displayed during normal operation.

- Drive Status
- Command source (terminal, keypad, ...)

5.4.13 The AC Drive shall have self-diagnostic properties to display faults and warnings as they occur. The AC Drive shall be able to store at least 8 last faults into the fault memory including the value of 11 parameters of monitoring for each fault. The fault memory shall be accessible by the programming terminal.

5.5 Application programming

The AC Drive shall be designed for both simple and the most complicated applications, yet it shall be user friendly. The AC Drive shall have built-in application macros available in the Simply Start menu, to allow selection of the range of pre-programmed control configurations and further, the AC Drive shall be able to store at least two customer modified macro-configuration, to suit the specific application. It shall be possible to reset the parameter settings back to the original macro settings through the keypad. The parameter readouts shall be in text format and not coded.

5.6 PC Tools:

The AC Drive Supplier shall have a Windows based PC software available for monitoring and controlling the AC Drives, and the software shall be offered as an option. The software shall be supplied with the necessary hardware and a provision for connecting a PC with the AC Drives. It shall be possible to set and modify parameters, control the drive, read actual values, and display and configure the oscilloscope function of the AC Drive.

6. Software features

6.1 Power loss ride-through

The drive shall have a power loss ride-through capability. This means that the drive controls should stay alive during a power loss by means of the energy stored in the load. The ride through time shall be the longer the higher the kinetic energy of the load is. The motor shall be magnetized as long as there is kinetic energy in the system.

6.2 Multi-motor or multi-configuration

The AC drive shall have 3 configurations, which can be activated remotely, allowing it to adapt to:

2 or 3 different motors or mechanisms in multi-motor mode. Each motor shall be protected thermally by the AC Drive 2 or 3 configurations for the same motor in multi-configuration mode. This function can also be used in another memory area, which can be retrieved from.



Bid Document No.BGL/339/2016-17

6.3 Multi-parameters

The AC Drive shall integrate and shall be able to switch 3 sets of 15 parameters when the motor is running.

6.4 Oscilloscope

The drive shall be able to store a total of 4000 points for one up to four channels. Trigger, time base, and channels shall be fully programmable by using the PC software. Display of the channels with zoom functions by using the PC Software

6.5 Service message

The drive shall be able to store 5 lines of 23 characters in order to display a message to the user or the maintenance people.

6.6 Diagnostic functions

The drive shall integrate test procedure to check the motor connection and the power components. Motor connection connection shall be tested at each run command.

6.7 Flying start

The drive shall have a built-in Flying Start feature. This feature will allow a Motor unit which is still rotating, to be restarted without first stopping it. The AC Drive shall restart the motor from the rotating speed and then reaccelerate to the speed indicated by the speed reference signal. The Flying Start feature shall be available in both directions, to be able to start the drive in the required direction regardless of the rotation direction of the motor.

6.8 Pre-fluxing

The AC Drive shall have a built-in pre-fluxing function. The pre-fluxing function minimises the time to establish the magnetising current and the load current so that the drive can still follow the given reference.

6.9 Flux braking

There shall be a possibility for Flux Braking, where AC Drives increases the motor magnetisation to dissipate the extra energy in case of need for small braking power. It shall be possible to use the braking to decelerate the motor from one speed to another - not only for stopping the motor.

6.10 Current/speed limiting

In case the acceleration or deceleration ramps are too fast for the drive capacity, the drive shall be able to automatically adapt the ramp to prevent tripping. Also, in case of transient overloads the drive shall automatically reduce speed to prevent an overcurrent trip, if the drive capacity is not sufficient to handle the load.

6.11 PID-regulator

The AC Drive shall have a built-in PID-controller for control of the customer process. Others functions such as Preset PID reference, automatic/manual, predictive speed shall be available.

6.12 Restart

In the event of a fault trip due to overvoltage, overcurrent or loss of analogue signal, the AC DRIVE shall be programmable to attempt an automatic restart. For safety reasons, the maximum number of attempts shall be within a selectable time. If the fault does not clear after the attempts, the drive shall lock out.



Bid Document No.BGL/339/2016-17

6.13 Unbalanced load function (“ENA system”)

The AC DRIVE shall have a built-in function for control of the unbalanced loads such as petrol pumps, printing press, in order to minimise mechanical constraints, to reduce line current, to save energy and to run without any external braking unit. Only braking resistance should be connected for better controlled.

6.14 Downstream contactor control

The AC Drive shall have a built-in function for control downstream contactors in order to follow the safety requirements for lift applications, for instance. The AC Drive shall monitor and manage the consistency between the contactor command and its effective state.

6.15 Brake logic control

The AC Drive shall have a built-in function to control a mechanical brake in order to move the load in a smooth and safe way. The brake logic control shall be adapted to the different movements : hoisting, translation, orientation. Others functions such as brake feedback management, high speed, brake impulse, limit switch management, load sharing, weight measurement shall be available.

6.16 Operations on reference

The speed reference shall be able to be summed, subtracted or multiplied.

6.17 Torque control

The AC Drive shall be able to operate as speed control or torque control. Both control mode could be switched. Motor torque could be individually limited in motor and generator quadrant.

6.18 Line contactor command

The AC Drive shall be able to manage a line contactor depending on the Run command it receives.

7. Environmental effects

7.1 Harmonic Distortion

Note to Specifier, : Guidelines for voltage and current distortion are addressed in IEEE Standard 519-1992 titled "IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems", which suggests distortion limits dependent upon the electric power distribution system for industrial and commercial consumers. Collectively, all facility loads and the building electrical distribution network determine the harmonic levels at the user & electric utility interface. The Electrical Power Research Institute (EPRI) recognizes the ‘Point of Common Coupling’ or PCC as the interface between user and electric utility (energy meter) in the electrical distribution network. The AC Drives Manufacturer/ Company Authorised SI can provide calculations through computer modeling, specific to the installation, showing total harmonic voltage distortion. Contractor to provide online diagram drawings to supplier including transformer impedance. The AC Drive Manufacturer/ Company Authorised SI needs this information.

7.1.1 A harmonic distortion analysis shall be performed and priced as a separate line item by the AC Drive Manufacturer/ Company Authorised SI based upon documentation supplied by the contractor. The documentation shall consist of one-line diagrams, distribution transformer information (kVA, %Z, and X/R ratio) and emergency standby



Bid Document No.BGL/339/2016-17

generator performance specifications. The harmonic distortion analysis report shall be part of the approval drawing process, submitted to the engineer for approval.

7.1.2 If the calculations determine that harmonic distortion values are higher than the voltage and current values specified, the drive Manufacturer/ Company Authorised SI shall provide solutions to comply with :

- IEC 61800-3-12
- IEEE 519-1992 guidelines

7.2 EMC Regulations and Compatibility / UL/CSA / C-Tick / Ghost

7.2.1 The supplied AC Drive shall have built-in EMC filters and carry the CE marking indicating that they comply with the essential requirements of the relevant EU directives. The AC Drives shall meet the requirements set in EN 61800-3 for Industrial Low-Voltage Networks.

7.2.2 A detailed description and other directions to ensure the EMC Compatibility during the installation of the AC DRIVE and associated field cables and connections, shall be given by the Supplier to comply with the EMC Directives. The Contractor shall follow the directions during installation, in order to achieve attenuation of the RFI.

7.2.3 The supplied AC Drives shall carry the C-Tick mark indicating that they comply with the essential requirements of the relevant Australian directives

7.2.4 The supplied AC Drives shall carry the UL mark indicating that they comply with the essential requirements of the relevant American directives.

7.2.5 The supplied AC Drives shall carry the CSA mark indicating that they comply with the essential requirements of the relevant Canadian directives.

8. Documents

8.1 Documents to be delivered with the delivery

The following documents have to be delivered with the delivery:

Manuals: These must contain instructions on how to install and start-up the AC Drive, how to program the AC Drive, instructions for maintenance and for trouble shooting.

Drawings: Dimension drawings, control connection diagram. Quality assurance: Test reports if requested

On request :

Environmental aspect : the AC Drive Manufacturer/ Company Authorised SI shall also present documents to prove that impact on environment has been taken into account during all the lifecycle of the product (manufacturing, distribution, use, end of life), the software used to measure impact shall be E.I.M.E. or equivalent.

Note: Bidder shall submit required catalogue/technical specifications supporting to above technical specifications along with the Bid.



Bhagyanagar Gas Ltd.
BHAGYANAGAR GAS
LIMITED

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

VOLUME
II OF II

Bid Document No.BGL/339/2016-17

SECTION – 9

SCHEDULE OF RATES



Bhagyanagar Gas Ltd.

BHAGYANAGAR GAS
LIMITED

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

VOLUME
II OF II

Bid Document No.BGL/339/2016-17



BHAGYANAGAR GAS
LIMITED

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

**VOLUME
II OF II**

Bid Document No.BGL/339/2016-17

SCHEDULE OF RATES (SOR)

Tender: BGL/339/2016-17 dtd 29.12.2016

Item: Procurement of Variable Frequency Drive (VFD)

Project: CNG & CGD Projects in Hyderabad

S.No	Description of Item	Unit	Qty	Unit rate excluding ED & ST	Per unit		Per unit sales Tax (ST) with C form/Concession al Form		Per unit Freight upto project site by road including transit insurance, & all other taxes like octroi, entry tax	Total Amount (A)
					Excise Duty	unit				
					5	6=(4*5)	7	8=(4+6)*7	9	10 = 3*(4+6+8+9)
					%	(Rs.)	%	(Rs.)	(Rs.)	(Rs.)
A. Supply of Variable Frequency Drive (VFD):										
For Hyderabad										
A.1	Supply of VFD's suitable for Compressor Motor of 90KW including control system,AC line choke and as per technical Specification of tender	Nos	6							
For Vijayawada										
A.2	Supply of VFD's suitable for Compressor Motor of 90KW including control system,AC line choke and as per technical Specification of tender	Nos	4							

**Rate Contract Tender for procurement of VFD's
(Variable Frequency Drives) for CNG stations in
Hyderabad & Vijayawada**

VOLUME
II OF II

Bid Document No.BGL/339/2016-17

B. Site Activity

S.No	Description of Item	Unit	Qty	Unit rate	Per Unit service Tax		Total Amount including all Taxes (B)
	1	2	3	4	5	6 = (4*5)	7 =2*(4+6)
				(Rs.)	%	(Rs.)	(Rs.)
B.1	Hyderabad: Installation, Commissioning of VFD's including supply of required rated power cable & miscellaneous expenses such as Boarding, Lodging charges of installation person and as per Scope of work mentioned in tender	No's	6				
B.2	Vijayawada: Installation, Commissioning of VFD's including supply of required rated power cable & miscellaneous expenses such as Boarding, Lodging charges of installation person and as per Scope of work mentioned in tender	No's	4				
Gross Total Price inclusive of all taxes and duties in Rs.(A.1+A.2+B.1+B.2)							

Notes:

1. The Rates should be in INR and is inclusive of all taxes and duties.
2. Evaluation will be done at lowest cost to Owner(BGL)
3. Bidder should quote for all the items.